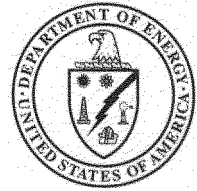


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Revision 0
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U.S. Department of Energy
Idaho Operations Office

Remedial Design/Remedial Action Work Plan for Operable Units 6-05 and 10-04, Phase I



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Revision 0
Project No. 23368

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February 2004

Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

The remedial design/remedial action (RD/RA) for Operable Unit (OU) 6-05 (Waste Area Group [WAG] 6) and OU 10-04 (WAG 10)—collectively called OU 10-04—has been divided into four phases. Phase I consists of developing and implementing institutional controls at OU 10-04 sites and developing and implementing Idaho National Engineering and Environmental Laboratory (INEEL)-wide plans for both institutional control and ecological monitoring. Phase II will remediate sites contaminated with trinitrotoluene (TNT) and Royal Demolition Explosives (RDX). Phase III will remediate lead contamination at a gun range, and Phase IV will remediate hazards from unexploded ordnance (UXO).

Phase I of the RD/RA for OU 10-04 also includes removal or isolation of identified surface UXO and TNT/RDX fragments that pose an unacceptable near-term physical hazard. This is a condition negotiated by the U.S. Environmental Protection Agency, the Idaho Department of Environmental Quality, and the U.S. Department of Energy as documented in *Operable Units 6-05 and 10-04, Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites, Remedial Design/Remedial Action Scope of Work*, because the phased approach postpones remediation of sites contaminated with UXO and TNT/RDX fragments. Surface UXO and TNT/RDX fragments identified in Phase I during routine operations will be assessed by explosives experts and will be removed and disposed of or isolated in an exclusion zone if they pose an unacceptable near-term physical hazard. Removal or isolation activities during Phase I of the RD/RA will not initiate full remediation of the contaminated areas. Further remediation will be performed in subsequent phases, although it may not be possible to ensure complete recovery of UXO and TNT/RDX fragments at the conclusion of remedial action.

Both RD/RA work plans and the corresponding operations and maintenance plans will be submitted for each remediation phase. This document describes only those activities to be performed in Phase I of the RD/RA for OU 10-04 sites. Elements pertaining to construction activities are not included, because this limited scope does not include construction activities typical of RD/RA at other INEEL sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

The *Idaho National Engineering and Environmental Laboratory Sitewide Institutional Controls Plan for CERCLA Response Actions* and the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory*, prepared as stipulated by this RD/RA Work Plan, were developed in accordance with requirements in the *Record of Decision—Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites, Operable Units 6-05 and 10-04*. The same Record of Decision also assigns OU 10-08, added under WAG 10, responsibility for (1) INEEL-wide groundwater issues not assigned to other WAGs and (2) new

sites passed to WAG 10 by other WAGs. Therefore, OU 10-04 will not address groundwater and new sites.

The *Idaho National Engineering and Environmental Laboratory Sitewide Institutional Controls Plan for CERCLA Response Actions* is the principal document governing establishment, implementation, enforcement, and monitoring of institutional controls at all INEEL sites as required by CERCLA. Therefore, all specific institutional control requirements for OU 10-04 sites are included in the *Idaho National Engineering and Environmental Laboratory Sitewide Institutional Controls Plan for CERCLA Response Actions*, and the main text of this RD/RA Work Plan only identifies OU 10-04 sites requiring institutional controls and the associated institutional control requirements.

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ACRONYMS

BORAX	Boiling-Water Reactor Experiment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
EBR-I	Experimental Breeder Reactor 1
EPA	U.S. Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
IDEQ	Idaho Department of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
NE-ID	U.S. Department of Energy Idaho Operations Office
NOAA	National Oceanic and Atmospheric Administration
NODA	Naval Ordnance Disposal Area
O&M	operation and maintenance
OMRE	Organic-Moderated Reactor Experiment
OU	operable unit
RD/RA	remedial design/remedial action
RDX	Royal Demolition Explosive
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
STF	Security Training Facility
TNT	trinitrotoluene
UXO	unexploded ordnance
WAG	waste area group

Remedial Design/Remedial Action Work Plan for Operable Units 6-05 and 10-04, Phase I

1. INTRODUCTION

In accordance with the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) among the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (IDEQ)—hereafter referred to as “the Agencies”—DOE submits this *Remedial Design/Remedial Action Work Plan for Operable Units 6-05 and 10-04, Phase I*. Under the current remediation strategy outlined in the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991), the location identified for the remedial action—hereafter referred to as OU (Operable Unit) 10-04—is designated as Waste Area Group (WAG) 6, OU 6-05 Experimental Breeder Reactor I (EBR-I)/Boiling Water Reactor Experiment (BORAX) and WAG 10, OU 10-04 Miscellaneous Sites at the Idaho National Engineering and Environmental Laboratory (INEEL). In addition, WAG 10 includes OU 10-08, which was added to address INEEL-wide groundwater issues and new sites that are passed by other groups to WAG 10. Operable Unit 10-08 will prepare the OU 10-08 comprehensive remedial investigation/feasibility study (RI/FS) and the Record of Decision (ROD). Therefore, OU 10-04 will not address INEEL-wide groundwater issues or potential new sites.

As required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.), the OU 10-04 remedial action will proceed in accordance with the signed *Record of Decision—Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites, Operable Units 6-05 and 10-04* (DOE-ID 2002a). The OU 10-04 ROD (DOE-ID 2002a) presents the selected remedies for 50 surface sites evaluated under the *Comprehensive Remedial Investigation/Feasibility Study for Waste Area Groups 6 and 10 Operable Unit 10-04* (DOE-ID 2001).

The remedial action for OU 10-04 is divided into four phases. Phase I consists of developing and implementing institutional controls at OU 10-04 sites and developing and implementing INEEL-wide plans for both institutional control and ecological monitoring. Phase II will remediate sites contaminated with trinitrotoluene (TNT) and Royal Demolition Explosive (RDX). Phase III will remediate lead contamination at a gun range, and Phase IV will remediate hazards from unexploded ordnance (UXO). Separate remedial design/remedial action (RD/RA) work plans will be submitted for each phase of remediation. The scope and schedule for implementing these remediation phases are presented in *Operable Units 6-05 and 10-04, Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites, Remedial Design/Remedial Action Scope of Work* (DOE-ID 2003a).

Phase I activities could require removal or isolation of surface UXO and explosives (TNT and RDX fragments) that are discovered during routine operations and present an unacceptable near-term physical hazard. The decision to remove or isolate surface ordnance and explosives will be based on a qualitative safety/hazard assessment that considers the likelihood of encounter with ordnance and explosives and the likelihood and severity of an unintentional detonation, as described in the *Operations and Maintenance Plan for Operable Units 6-05 and 10-04, Phase I* (DOE-ID 2003b). The intent of such removal/isolation actions is to address imminent safety hazards; however, the intent is not to remediate conditions that can be deferred for future phases of remedial action. Therefore, any removal or isolation of surface ordnance and explosives during Phase I remediation will not necessarily initiate a survey for detection and removal/isolation of other TNT/RDX fragments or UXO, as these actions will be performed during remediation Phases II and IV, respectively.

The OU 10-04 RI/FS (DOE-ID 2001) determined that nine sites require remediation, because contamination of the ground surface poses an unacceptable risk to human health and the environment. Eight of these sites became contaminated during and after World War II when the U.S. Navy and the U.S. Army Air Corps used part of what is now the INEEL for ordnance testing, demolition of explosives, and bombing practice. These eight sites are separated into two groups as follows:

- Group 1—Group 1 consists of three large ranges, hereafter called the ordnance areas: (1) the Naval Gun Range, (2) Arco High-Altitude Bombing Range, and (3) Twin Buttes Bombing Range. These three sites must be remediated to mitigate risk to human health from UXO.
- Group 2—Group 2 includes five sites inside the Naval Gun Range that were contaminated with chemical compounds (principally TNT and RDX) during explosive tests: (1) the Field Station, (2) Fire Station, (3) Land Mine Disposal Area, (4) National Oceanic and Atmospheric Administration (NOAA), and (5) Naval Ordnance Disposal Area (NODA).

The ninth site, the Security Training Facility (STF) -02 Gun Range, was used for security training by INEEL personnel and has unacceptable levels of lead contamination from spent bullets.

No additional remediation will be conducted under CERCLA for the remaining 41 of the 50 sites in OU 10-04. However, limited action consisting of institutional controls will be maintained at the seven sites listed below, because residual contamination precludes unrestricted land use and action is required to minimize potential human exposure to contamination. Only institutional controls are required to ensure protection of human health and the environment at these sites.

Seven sites addressed in this RD/RA Work Plan require limited action under the OU 10-04 ROD (DOE-ID 2002a):

- BORAX II-V leach pond
- BORAX I reactor burial site
- BORAX ditch
- BORAX II-V reactor building
- EBR-I fuel oil tank
- Organic-Moderated Reactor Experiment (OMRE) leach pond
- Juniper Mine.

In addition, OU 10-04 is responsible for development of a comprehensive approach for establishing, implementing, enforcing, and monitoring institutional controls at all INEEL CERCLA sites requiring institutional controls.

To address concerns about sustaining a healthy environment at the INEEL, the OU 10-04 RI/FS (DOE-ID 2001) also included an analysis of ecological risk. The OU 10-04 INEEL-wide ecological risk assessment compiled information from previous investigations of risk to ecological receptors at each WAG into a depiction of the effects of contamination on the INEEL's environment as a whole. Because of multiple uncertainties and assumptions in the assessment, the OU 10-04 ROD (DOE-ID 2002a) specified that INEEL-wide long-term ecological monitoring would be implemented.

1.1 Purpose and Scope of the Remedial Design/Remedial Action Work Plan

The purpose of this RD/RA Work Plan is to describe the institutional controls to be implemented at OU 10-04 sites and the long-term ecological monitoring to be conducted at the INEEL. This RD/RA Work Plan is prepared in accordance with requirements under CERCLA (42 USC § 9601 et seq.) and the FFA/CO (DOE-ID 1991). The following items are included in this RD/RA Work Plan:

- Background and description of OU 10-04 sites to be remediated
- Project description, including the institutional control requirements for OU 10-04 sites
- Project management
- An updated schedule and cost for OU 10-04 Phase I remediation activities
- Related plans
- Preparation of the remedial action report
- Five-year review requirements.

1.2 Background and Site Description

Located 51 km (32 mi) west of Idaho Falls, Idaho, the INEEL is a government-owned, contractor-operated facility managed by the U.S. Department of Energy Idaho Operations Office (NE-ID)^a (Figure 1-1). Occupying 2,305 km² (890 mi²) of the northeastern portion of the Eastern Snake River Plain, the INEEL encompasses portions of five Idaho counties: (1) Butte, (2) Jefferson, (3) Bonneville, (4) Clark, and (5) Bingham.

Waste Area Groups 6 and 10 are designated as two of 10 WAGs located at the INEEL. Waste Area Group 6 contains two adjacent areas known as EBR-I and BORAX. Waste Area Group 10 is comprised of various areas known as miscellaneous sites. Background information for EBR-I, BORAX, and the miscellaneous sites is discussed in the OU 10-04 ROD (DOE-ID 2002a), the OU 10-04 RI/FS (DOE-ID 2001), and the *Proposed Plan for Operable Unit 10-04, Waste Area Groups 6 and 10* (DOE-ID 2002b).

Waste Area Group 6 consists of sites related to EBR-I and BORAX, which are located close together in the southwest portion of the INEEL (Figure 1-2) and have similar operational backgrounds and sources of contamination. The EBR-I reactor was the first reactor built on the INEEL. In 1951, it became the first reactor in the world to generate electricity from nuclear power. Of the many buildings that once made up the EBR-I complex, only the original reactor building (now a national historic landmark) and associated structures remain.

a. The abbreviation NE-ID signifies that the U.S. Department of Energy Idaho Operations Office (which was abbreviated DOE-ID before October 1, 2003) reports to the DOE Office of Nuclear Energy, Science, and Technology.

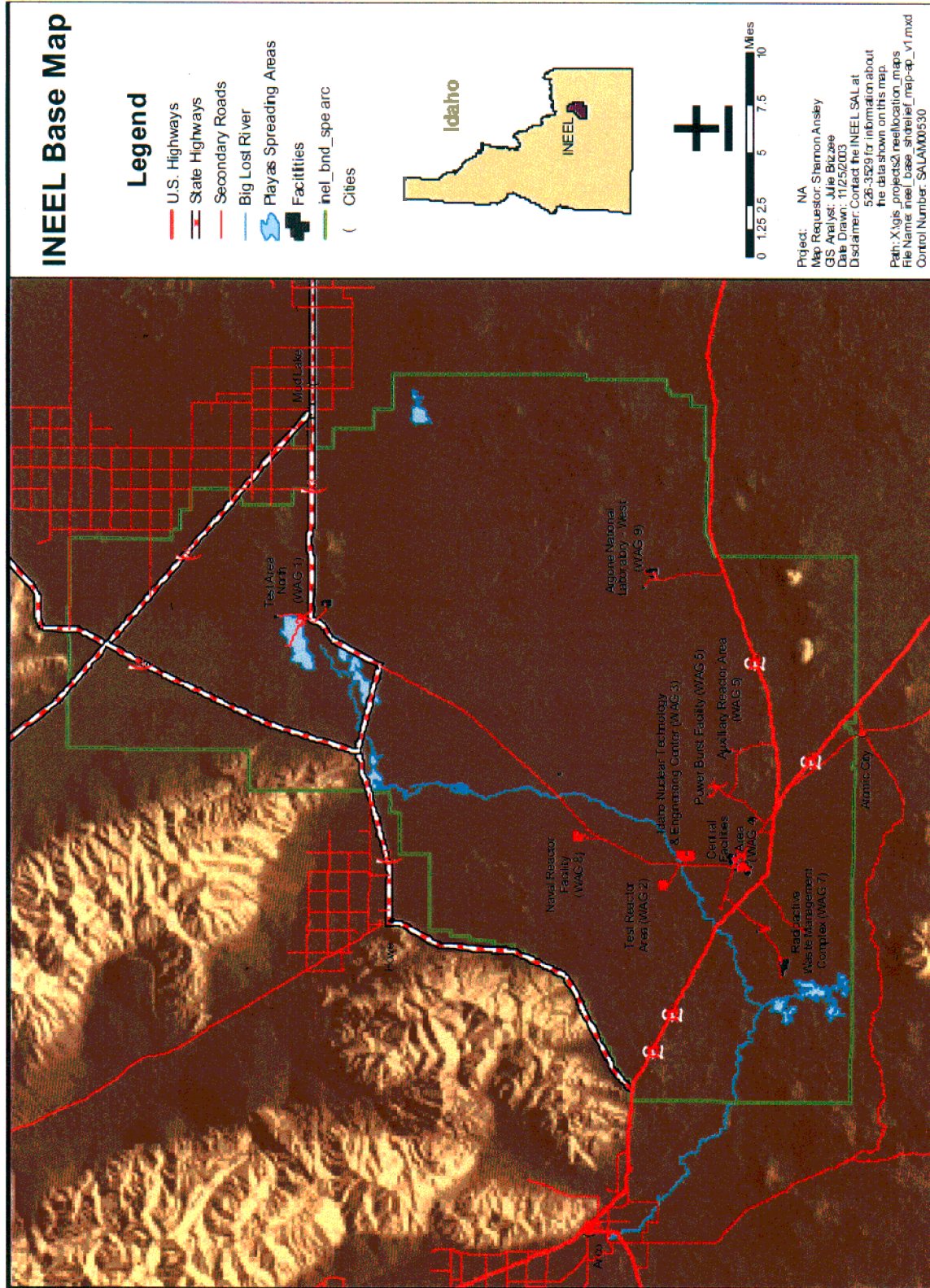


Figure 1-1. Idaho National Engineering and Environmental Laboratory.

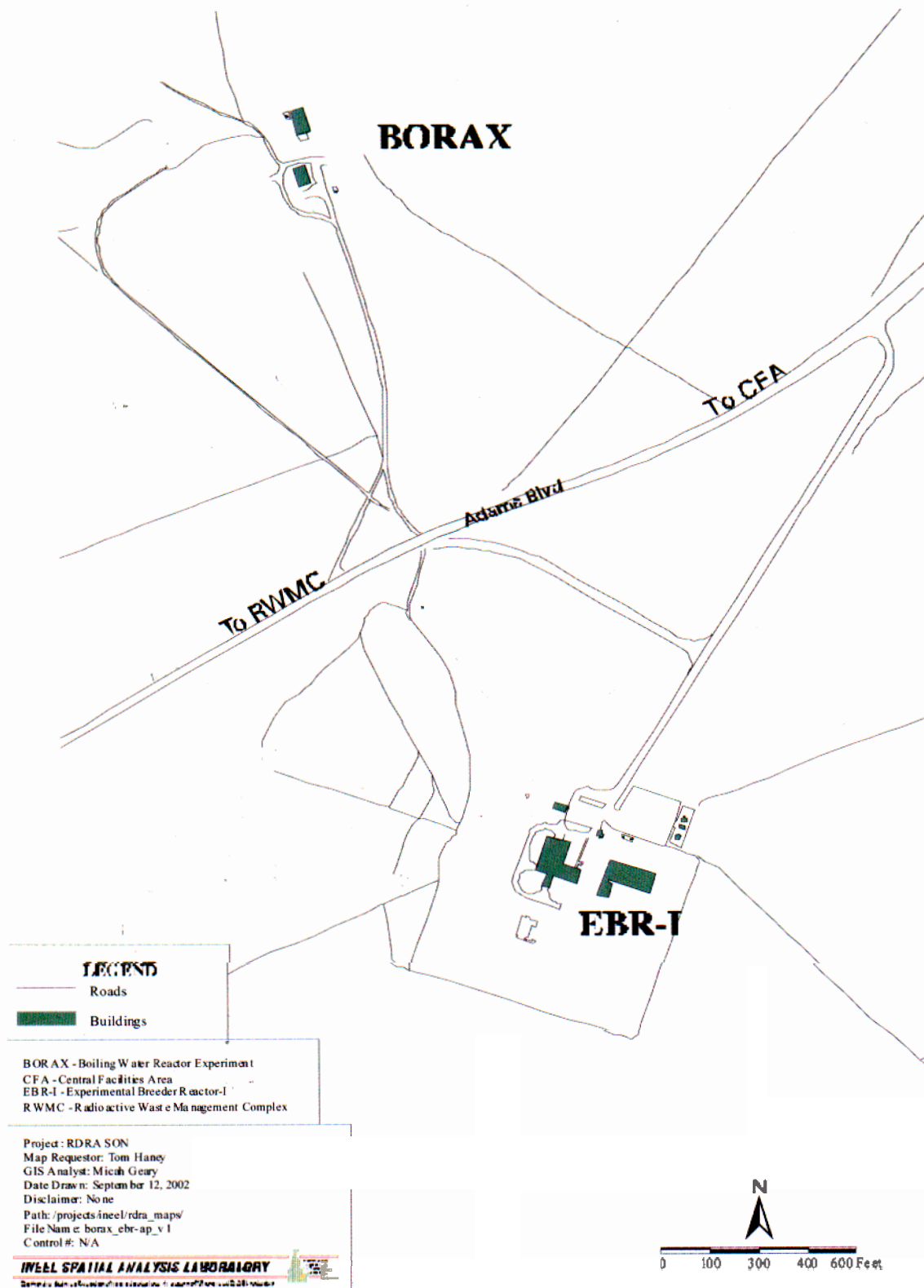


Figure 1-2. Waste Area Group 6 at the Idaho National Engineering and Environmental Laboratory.

The BORAX facility included five experimental reactors, built between 1953 and 1964, for research in generating electricity using boiling-water reactors. On July 17, 1955, BORAX III became the first nuclear reactor to power a town, when it supplied electricity to Arco, Idaho. During research on reactor safety, the BORAX I reactor was intentionally destroyed in 1954, and its burial location underwent final remediation in 1996 (DOE-ID 2001). All other facilities at BORAX have been removed and the areas have been remediated. Figure 1-2 shows the WAG 6 CERCLA sites.

Waste Area Group 10 includes miscellaneous INEEL sites and the portions of the Snake River Plain Aquifer outside WAGs 1–9 at the INEEL. The WAG 10 sites assessed under OU 10-04 include the Liquid Corrosive Chemical Disposal Area; the OMRE leach pond; the sites related to the Experimental Organic-Cooled Reactor (later called the STF); the STF sumps, pits, and gun range; and numerous ordnance areas. In addition, the Idaho Chemical Processing Plant's fly ash pit was added to OU 10-04 for an ecological risk assessment. As mentioned previously, OU 10-08 will address assessment of INEEL-wide groundwater issues and any new sites identified after development of OU 10-04 in a future RI/FS and ROD. Figure 1-3 shows the INEEL with the WAG 10 CERCLA sites.

1.2.1 Description of Operable Unit 10-04 Sites

1.2.1.1 BORAX II–V Leach Pond. The BORAX II–V leach pond was used from 1954 to 1964 to collect low-level, radioactively contaminated liquid discharges from the BORAX II–V experiments. The leach pond was located approximately 1.2 km (0.8 mi) north of EBR-I and about 18 m (60 ft) south of the BORAX cooling tower. Wastewater was piped from the turbine and reactor building to the pond, where the effluents evaporated or seeped into the ground. In 1984, the pond was backfilled with clean soil.

1.2.1.2 BORAX I Reactor Burial Site. The BORAX I reactor burial site is located about 832 m (2,730 ft) northwest of the EBR-I reactor building. The BORAX reactor was constructed in 1953 and after a period of testing was intentionally destroyed in 1954. In 1955, the contaminated soil and structures were buried in place. In 1996, a human intrusion barrier (riprap) was placed over the burial site.

1.2.1.3 BORAX Ditch. The BORAX ditch was the site of a radionuclide-contaminated drainage ditch associated with the BORAX II–V reactor experiments. Wastewater was piped from the reactor building to the ditch, where it evaporated or seeped into the ground. In 1995, a non-time-critical removal action focused on Cs-137 as the contaminant of concern, thereby resulting in the removal of about 890 m³ (1,178 yd³) of radionuclide-contaminated soil. The ditch was then backfilled and graded flat.

1.2.1.4 BORAX II–V Reactor Building. The BORAX II–V site consists of the entombed and buried structures remaining from the Argonne Experimental Facility. Underground items include reactor vessels, a water storage pit (now dry), equipment pit, subreactor room, utility pipe trench, and a dry storage pit. The area around the site is fenced with chain-link and barbed wire and is posted as a radiation area to restrict entry.

1.2.1.5 EBR-I Fuel Oil Tank. The EBR-I fuel oil tank was an underground steel tank with a capacity of 16,086 L (4,250 gal). Records indicate the tank was installed in 1952, contained No. 2 diesel heating fuel, was last used in 1988, and was never used for waste disposal. In 1989, the tank was emptied when a leak was discovered. In 1990, the tank and associated piping were removed. The diesel-contaminated soil was subsequently removed, but two areas that were inaccessible might require further treatment. The first is on the excavation's south side, where a sewer line prevented soil removal deeper than 1.5 m (5 ft). The second is beneath a radiologically contaminated overhead trolley located 0.6 m (2 yd) east of the excavation that hindered soil removal from an area east of the excavation.

INEEL WAG-10 CERCLA SITES

KEY TO CERCLA SITES

Operable Site	Unit	Action	Description
10-00	ARVFS-01	No Action	ARVFS Containers of Contaminated Nak
10-00	ARVFS-02	No Action	ARVFS Tank Containing Low-level Radioactive Waste (under white building)
10-00	EOCR-02	No Action	EOCR Injection Well
10-00	EOCR-03	No Action	EOCR Oxidation Pond
10-00	EOCR-04	No Action	EOCR Septic Tank
10-00	EOCR-05	No Action	EOCR Blowdown Sump (EOCR 719)
10-04	STF-01	RT/FS-NSI	STF-601 Sumps and Pits
10-00	EOCR-01	No Action	EOCR Leach Pond
10-01	LCCDA-01	Track 2	LCCDA Old Disposal Pit (west end)
10-01	LCCDA-02	Track 2	LCCDA Limestone Treatment and Disposal Pit (east end)
10-01	LCCDA-EZ	Track 2	Exclusion Zone for LCCDA-01 and LCCDA-02
10-00	ZPPR-01	No Action	ZPPR Disposal Pit (outside ANL-W fence)
10-04	STF-02	RT/FS-NSI	STF Gun Range

KEY TO ORDNANCE AREAS

- 1 - Arco High Altitude Bombing Range
- 2 - Naval Ordnance Test Facility (NOTF) (Vietnam Era) and
- 3 - CFA-633 Naval Firing Site and Downrange Area
- 4 - CFA Gravel Pit
- 5 - CFA Sanitary Landfill Area
- 6 - Naval Ordnance Disposal Area (NODA)
- 7 - Explosive Storage Bunkers - North of ICPP
- 8 - National Oceanic & Atmospheric Administration (NOAA)
- 9 - Twin Buttes Bombing Range
- 10 - Fredonia II Zone and Range Five Burn Area
- 11 - Anacostia Power Line
- 12 - Old Military Structures
- 13 - Mass Detonation Area
- 14 - Dairy Farm Recreations
- 15 - Experimental Field Station
- 16 - Ordnance East of TRKA
- 17 - Burn Area South of Experimental Field Station
- 18 - Igloo-Type Structure Northwest of Experimental Field Station
- 19 - Kalcar Explosion Area
- 20 - Shell East of ARVFS
- 21 - Jumper Mine
- 22 - Projectiles
- 23 - Rifle Range
- 24 - Landmine and Fuse Burn Area
- 25 - East of the Big Lost and North of NRF (Same as Kalcar Site #19)
- 26 - Zone East of the Big Lost River
- 27 - Dirt Mounds Near the Experimental Field Station, NOAA, and NRF
- 28 - Craters East of ICPP
- 29 - Big Southern Butte
- 30 - Projectile Detonation Area
- 31 - Land Mine Detonation Area
- 32 - Common Projectiles
- 33 - Common Projectiles
- 34 - Common Projectiles and Fuzes
- 35 - Frag and RDX in and around crater
- 36 - Crater projectiles
- * - Northern Most Projectile Round (16" inert)

- ### LEGEND
- U.S. Highways
 - State Highways
 - Paved or Light-Duty Roads
 - Railroad Tracks
 - Rivers and Streams
 - Buttes
 - INEEL Boundary
 - Spreading Areas and Playas
 - Ordnance Areas
 - Cities and Towns

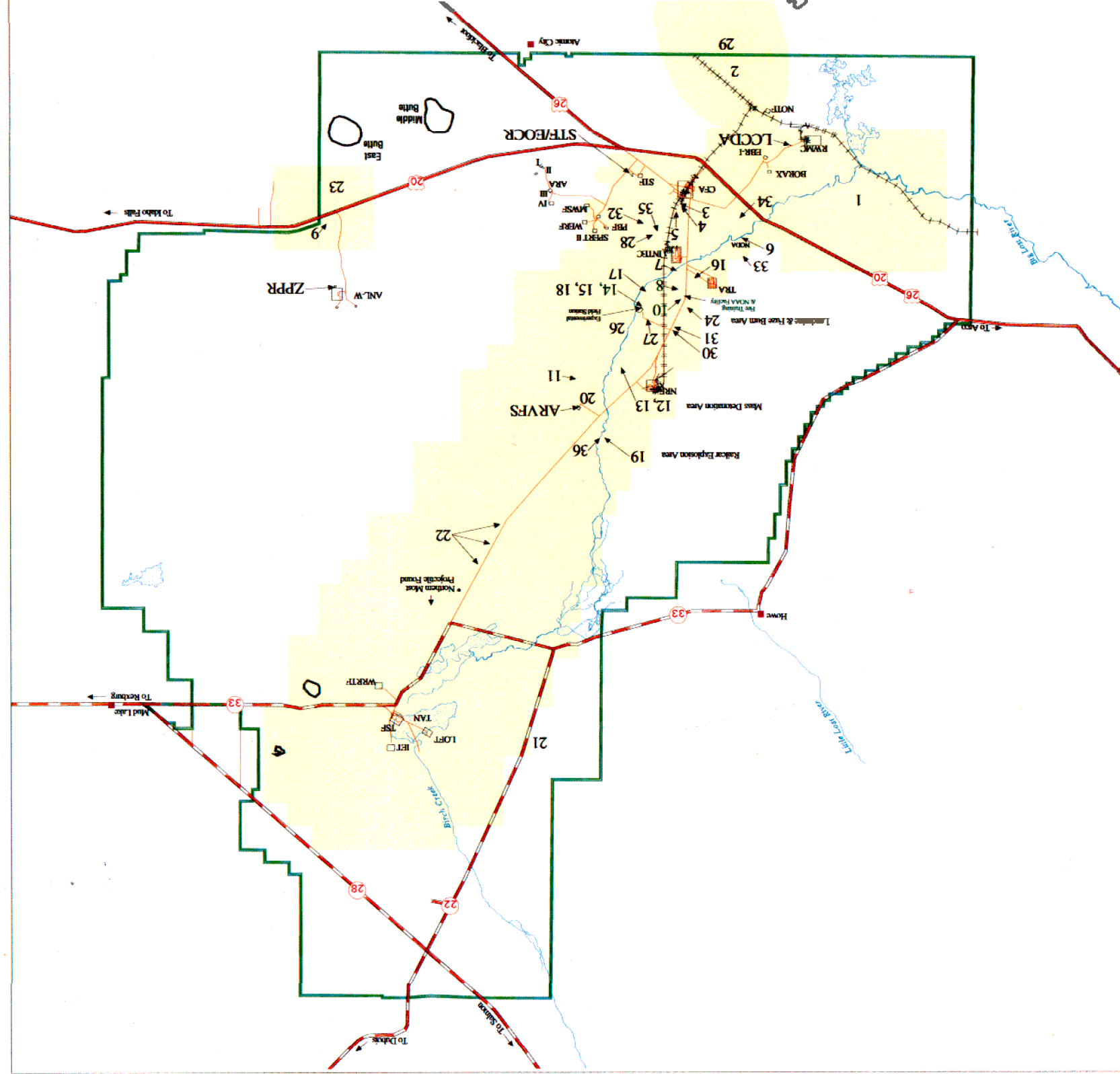


Figure 1-3. Waste Area Group 10 at the Idaho National Engineering and Environmental Laboratory.

1.2.1.6 Organic-Moderated Reactor Experiment Leach Pond. Wastewater from the OMRE reactor was discharged into the OMRE leach pond. The reactor operated from 1957 to 1963 and was located approximately 3.25 km (2 mi) east of the Central Facilities Area. During reactor operation, wastewater was piped to the pond, where it evaporated or seeped into the ground. Suspected contaminants were primarily short-lived radionuclides, metals, and organics. The coolant organics included high-boiling-point components similar to wax; however, it is expected that neutron bombardment decomposed some components to low-boiling-point organics (such as benzene, toluene, ethylbenzene, and xylene). In 1979, a portion of the pond soil was excavated and disposed of at the Radioactive Waste Management Complex. The cleanup goal at the time was 1,000 pCi/g and contaminated soil above that limit remains. The pond has since been backfilled and the area has been revegetated with grass.

1.2.1.7 Juniper Mine. The Juniper Mine was used in 1974 to conduct seismic tests using high explosives. Four of the five detonations during the tests were in the vertical shaft of the Juniper Mine. The high explosive, IREGEL 376, that was used contained ammonium nitrate as its primary ingredient. On September 18, 1974, a test detonation designated HE-3 failed, leaving approximately 7,258 kg (16,000 lb) of high explosives buried in the mineshaft at a depth of 29 m (95 ft). A subsequent test detonation at a depth of 18 m (59 ft) on October 17, 1974, apparently failed to detonate the HE-3 charge (Navarro 1975). Up to six 1-lb TNT-based explosive boosters and an undetermined amount of severed detonation cord might also remain.^b

The high explosives remaining in the Juniper mineshaft are located at a depth of approximately 29 m (95 ft). The mineshaft has been backfilled to the surface. The *Preliminary Scoping Track 2 Summary Report for Operable Unit 10-03 Ordnance* (DOE-ID 1998) concludes that even if the entire mass of residual explosives could be detonated, "...a hazard would not be produced above the ground, because of the amount of soil in the shaft and the depth of the explosives." The IREGEL 376 vendor^c stated that the explosive would likely not detonate even if the remaining boosters were detonated. The vendor also stated that it is unlikely the explosive would detonate if struck by a drill bit, excavator, etc. However, the boosters would likely remain capable of detonation indefinitely and could be set off if struck by a drill bit or excavator.

The depth to groundwater in the area is estimated at 126 m (413 ft), based on measurements from two United States Geological Survey wells located approximately 3 km (5 mi) north-northeast of the Juniper Mine. The mineshaft and upper aquifer in this area are located in a rhyolite rock formation, which typically is less fractured than basalt and likely to be less transmissive. The potential for groundwater contamination by nitrate, the only regulated constituent present in IREGEL 376, was evaluated using *GWSCREEN: A Semi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination, Version 2.5* (Rood 1998). The results, summarized in the OU 10-04 RI/FS (DOE-ID 2001), showed groundwater concentrations of nitrate in the upper aquifer directly below the mine shaft would be less than the 10-mg/L drinking water standard.

1.2.1.8 Ordnance Areas. The ordnance areas include three large artillery testing and bombing ranges used by the U.S. Navy and U.S. Army Air Corps during World War II. They are the Naval Gun Range (172,495 acres along the central corridor of the INEEL), the Arco High-Altitude Bombing Range (26,406 acres to the west), and the Twin Buttes Bombing Range (9,291 acres on the southeast periphery of the INEEL). Activities that left ordnance behind include aerial bombing practice, naval artillery testing,

b. Richard Green, Bechtel BWXT Idaho, LLC, personal communication, May 30, 2001.

c. Patrick S. Weber, Dyno Nobel, personal communication, May 29, 2001.

explosives storage bunker testing, and ordnance disposal. Complete details about the investigation of these areas are described in Section 12 of the OU 10-04 RI/FS (DOE-ID 2001).

1.2.1.9 Trinitrotoluene/Royal Demolition Explosive-Contaminated Soil Sites. The five TNT/RDX-contaminated soil sites (Field Station, Fire Station, Land Mine Disposal Area, NOAA, and NODA) are contaminated by chemical compounds remaining from military ordnance testing involving low-order detonations (i.e., TNT and RDX) along with the associated compounds dinitrotoluene and dinitrobenzene. All of these are explosive compounds common in ammunition. Stained soil and chunks of explosives are visible in widely scattered regions within the TNT/RDX contamination sites. Contamination at these sites is generally limited to the top 2 ft of soil. These sites might also contain UXO. The TNT and RDX in these sites pose a risk to future residents and a potential risk to groundwater.

1.2.1.10 STF-02 Gun Range. The STF-02 Gun Range is part of the former STF, which is approximately 3 km (2 mi) east of the Central Facilities Area. Between 1983 and 1990, INEEL security personnel fired approximately 5 million rounds into targets erected on six earthen berms and in a wooden building (the “shooting house”). Most of the rounds were directed toward the northern soil impact berm where 10 railroad ties held targets. The bullets fragmented and pulverized on impact with the railroad ties, with the soil, and with other bullets in the berm. Some fragments ricocheted beyond the berm into the “kickout” area. Bullet debris extends northward approximately 600 ft. An adjacent dry pond is also contaminated with bullet fragments. The human health risk at the gun range is from lead.

Based on records of the number and types of bullets purchased for use at the gun range, the site might contain 64 tons of lead as well as 3.5 tons of copper. Both of these metals could be recovered for recycling. Concentrations of lead are as high as 24,400 mg/kg (the maximum detected concentration) and extend to a maximum depth of 2 ft. Most of the lead and copper is in the form of shell casings and large bullet fragments.

1.3 Selected Remedy

The selected remedy for OU 10-04 comprises the following:

- Two remedial actions involving removal, treatment, and institutional controls at eight specific sites
- One remedial action involving removal and treatment at one site
- Remedial action to implement institutional controls at seven sites with development of an INEEL-wide institutional controls plan
- No action with long-term ecological monitoring.

Five-year reviews will be used to ensure the selected remedies remain protective and appropriate.

This RD/RA Work Plan addresses implementation of institutional controls at OU 10-04 sites, development of the *Idaho National Engineering and Environmental Laboratory Sitewide Institutional Controls Plan for CERCLA Response Actions* (DOE-ID 2003c), which establishes uniform requirements of the institutional control remedy components of all CERCLA FFA/CO institutional control sites at the INEEL, and development and implementation of the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory* (INEEL 2004). Future RD/RA work plans will be developed to address other components of the selected remedy for OU 10-04, as described in the OU 10-04 Scope of Work (DOE-ID 2003a).

2. PROJECT DESCRIPTION

The tasks included in this RD/RA Work Plan are identification of institutional control requirements for OU 10-04 sites and development of the Sitewide Institutional Controls Plan (DOE-ID 2003c) and the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory* (INEEL 2004). Because the Sitewide Institutional Controls Plan is the principal document for establishing, implementing, enforcing, and monitoring institutional controls at the INEEL, all such requirements for OU 10-04 sites are included in it and will not be duplicated in the main text of this RD/RA Work Plan.

2.1 Institutional Controls for Operable Unit 10-04 Sites

Institutional controls will be applied initially to 16 of the 50 sites in OU 10-04. In accordance with the OU 10-04 ROD (DOE-ID 2002a), institutional controls will not be required for the remaining 34 sites. Institutional controls will be maintained in the interim until the selected remedy has been implemented at nine of the 16 sites (i.e., Naval Gun Range, Arco High-Altitude Bombing Range, Twin Buttes Bombing Range, Field Station, Fire Station, Land Mine Disposal Area, NOAA, NODA, and the STF-02 Gun Range) identified for remediation in the ROD (DOE-ID 2002a) and will remain in effect until it is determined during a 5-year review that the controls are no longer necessary for a given site.

Since the phased approach to remediation for OU 10-04 sites postpones detection and removal of surface and subsurface UXO at three sites, TNT/RDX contamination at five sites, and residual lead at one site, prerediation institutional control requirements will be implemented to ensure adequate protection of human health and the environment. The *Operations and Maintenance Plan for Operable Units 6-05 and 10-04, Phase I* (DOE-ID 2003b) specifies prerediation requirements to ensure adequate protection of human health and the environment for these sites and includes requirements for prerediation removal of surface ordnance and explosives that pose an unacceptable near-term physical hazard. Any prerediation removal of surface ordnance and explosives under this RD/RA for institutional controls will not initiate full remediation of any site for UXO and or TNT/RDX. Rather, remediation for UXO and TNT/RDX contamination will be implemented in future remediation phases for OU 10-04, as described in the OU 10-04 Scope of Work (DOE-ID 2003a). Postremediation institutional control requirements for these sites will be addressed in future RD/RA work plans and associated operation and maintenance (O&M) plans.

In addition to the nine sites requiring remediation, DOE will maintain institutional controls at seven sites until released during a 5-year review. These seven sites present risk greater than 1E-06, but less than 1E-04 and a hazard index of less than 1 for the future residential scenario. Table 2-1 lists all OU 10-04 sites requiring institutional controls and the controls that will be applied.

2.2 Idaho National Engineering and Environmental Laboratory-Wide Institutional Control Plan

The OU 10-04 ROD (DOE-ID 2002a) mandates development of a comprehensive INEEL-wide approach for establishing, implementing, enforcing, and monitoring institutional controls in accordance with EPA Region 10 policy (EPA 1999) at all CERCLA sites requiring institutional controls within the INEEL. The Sitewide Institutional Controls Plan (DOE-ID 2003c) was prepared to satisfy requirements in

Table 2-1. Institutional control requirements for Operable Unit 10-04 sites.

Site Name	Institutional Control Requirements
BORAX II–IV Leach Pond	Restrict land use to prohibit exposure to radiologically contaminated soil.
BORAX-I Burial Site	Maintain present land use controls to prevent intrusion into buried waste and radiologically contaminated soil.
BORAX Ditch	Restrict land use to prevent exposure to radiologically contaminated soil.
BORAX II–IV Reactor Building	Maintain present land use controls to prevent intrusion into buried waste and radiologically contaminated soil.
EBR-I Fuel Oil Tank	Restrict site to industrial use until discontinued based on results of a 5-year review.
OMRE Leach Pond	Restrict land use to prevent exposure to radiologically contaminated soil.
Juniper Mine	Maintain present land use controls to prevent intrusion into buried explosive material.
Ordnance Areas: Naval Gun Range, Arco High-Altitude Bombing Range, and Twin Buttes Bombing Range	Maintain site access restrictions and land use control to inhibit inadvertent encounter with UXO until remediation is implemented as described in the OU 10-04 ROD (DOE-ID 2002a). Then, based on analysis of residual hazard, determine potential land use. Land use control after remediation (Phase IV) might not be required if it is confirmed that all UXO posing a risk is removed.
TNT/RDX-Contaminated Soil Sites: Field Station, Fire Station, Land Mine Disposal Area, NOAA, and NODA	Restrict land use to prevent exposure to TNT/RDX-contaminated soil and from physical hazards associated with fragments of TNT and RDX until remediation is implemented, as prescribed in the OU 10-04 ROD (DOE-ID 2002a). Land use controls after remediation (Phase II) will be reevaluated based on residual risk.
STF-02 Gun Range	Restrict land use to prevent unacceptable exposure to lead contamination in soil until remediation is implemented, as described in the OU 10-04 ROD (DOE-ID 2002a). Land use controls are not expected after remediation (Phase III), as all contamination above unrestricted land-use remediation goals will be removed from the site.
<div style="display: flex; justify-content: space-between;"> <div> <p>BORAX = Boiling Water Reactor Experiment</p> <p>EBR-I = Experimental Breeder Reactor I</p> <p>NOAA = National Oceanic and Atmospheric Administration</p> <p>NODA = Naval Ordnance Disposal Area</p> <p>OMRE = Organic-Moderated Reactor Experiment</p> <p>OU = operable unit</p> </div> <div> <p>RDX = Royal Demolition Explosive</p> <p>ROD = Record of Decision</p> <p>STF = Security Training Facility</p> <p>TNT = trinitrotoluene</p> <p>UXO = unexploded ordnance</p> </div> </div>	

the ROD (DOE-ID 2002a). The following elements are included in the comprehensive Sitewide Institutional Controls Plan (DOE-ID 2003c), as outlined in the policy:

- A comprehensive listing of all areas or locations at the INEEL that have institutional controls for protection of human health or the environment. The information in this list will include (at a minimum) the location of the area, the objectives of the restriction or control, the timeframe for which the restrictions apply, and the tools and procedures that will be applied to implement the restrictions or controls.

- Identification (made legally binding where appropriate) of all entities and persons including, but not limited to employees, contractors, lessees, agents, licensees, and invitees relevant to the INEEL institutional controls.
- Identification of all activities and reasonably anticipated future activities including, but not limited to future soil disturbance, routine and nonroutine utility work, well placement and drilling, grazing activities, groundwater withdrawals, paving, construction, renovation work on structures, or other activities that could occur on INEEL CERCLA sites with institutional controls.
- A tracking mechanism that identifies all land areas under restriction or control.
- A process to promptly notify both the EPA and the State of Idaho before any anticipated change in land-use designation, restriction, land users, or activity for any institutional control required by a decision document.

2.3 Idaho National Engineering and Environmental Laboratory-Wide Long-Term Ecological Monitoring

The INEEL-wide long-term ecological monitoring will be implemented under the OU 10-04 ROD (DOE-ID 2002a) to ensure protection of the INEEL ecosystem. The purpose of long-term ecological monitoring is to minimize uncertainty in the INEEL-wide ecological risk assessment, allow coordination with ongoing environmental monitoring efforts, allow coordination with other agency activities, and address stakeholder concerns. The following items are provided in the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory* (INEEL 2004):

- A schedule for site walk-downs and visual inspections to ensure that assumptions in the risk assessment are still applicable
- Yearly sampling and analysis of site-specific flora and fauna to determine ecological contamination and to monitor possible migration of contamination by ecological receptors based on location or area-specific field sampling plans (approximately 10% of these samples will be taken from a reference area for background comparison)
- A waste management plan to characterize, assess, and dispose of contaminated media generated from field sampling (such as sample residue, sampling equipment, and personal protective equipment)
- Criteria for annual status reports to support the 5-year review
- Specifications for research studies to support the development and understanding of long-term trends in the INEEL ecology (such as measuring effects on INEEL populations or individual species).

3. PROJECT MANAGEMENT

3.1 Management Oversight

The NE-ID remediation project manager will be responsible for notifying the EPA and IDEQ of project activities (such as project startup, closeout, and inspections). In accordance with the FFA/CO (DOE-ID 1991), notification will be provided to EPA and IDEQ WAG managers a minimum of 14 calendar days before prefinal inspection activities.

The project manager also serves as the single interface point for all routine contact between the Agencies and INEEL contractor representatives. In addition, the NE-ID contractor will provide field support services for field oversight, health and safety, quality assurance, and landlord services for this project.

3.2 Related Codes, Standards, and Documents

The following national standards, codes, regulations, and site-specific documents will be used as the basis for establishing and maintaining institutional controls at OU 10-04 sites and implementing INEEL-wide ecological monitoring:

- DOE Order 231.1A, “Environment, Safety, and Health Reporting”
- DOE Order 232.1A, “Occurrence Reporting and Processing of Operations Information”
- DOE Order 414.1A, “Quality Assurance”
- DOE Order 435.1, “Radioactive Waste Management”
- DOE Order 440.1A, “Worker Protection Management for DOE Federal and Contractor Employees”
- DOE Order 470.1, “Safeguards and Security Program”
- DOE Order 5480.4, “Environmental Protection, Safety, and Health Protection Standards”
- *Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEL* (DOE-ID 1994)
- *Comprehensive Remedial Investigation/Feasibility Study Assessment for Waste Area Groups 6 and 10 Operable Unit 10-04* (DOE-ID 2001)
- *Record of Decision—Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites, Operable Units 6-05 and 10-04* (DOE-ID 2002a)
- *Idaho National Engineering and Environmental Laboratory Sitewide Institutional Controls Plan for CERCLA Response Actions* (DOE-ID 2003c)
- *INEEL Long-Term Stewardship Strategic Plan* (DOE-ID 2002c)
- *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory* (INEEL 2004).

3.3 Assumptions

The bounding assumptions under which these RD/RA activities will be performed include the following:

- The DOE will ensure that institutional controls are in effect to ensure protectiveness for at least 100 years from 1995 (the date land use assumptions were initially adopted) or until unrestricted land use is allowed again after determination in a 5-year review
- Any groundwater monitoring required for OU 10-04 sites will be conducted under the OU 10-08 INEEL-wide groundwater monitoring program
- Operable Unit 10-08 will evaluate new sites passed to WAG 10 and discovered during development of the OU 10-08 ROD
- Developed areas of the INEEL will remain in industrial use for the foreseeable future, and the undeveloped areas will continue to be used primarily for ecological and cultural preservation, environmental research, and controlled grazing and hunting.

3.4 Project Schedule

Table 3-1 provides the OU 10-04 remedial action schedule for institutional controls and long-term INEEL-wide ecological monitoring. This schedule covers all project tasks from the design phase to the completion of the remedial action report. Administrative document preparation activities are based on an 8-hour day, 5-day workweek, while field activities are based on a 10-hour day, 4-day workweek. The schedule does not include any contingency for delay because of late or slow document reviews or for field activities experiencing loss of productivity due to adverse weather conditions or other causes outside the project team's control.

Table 3-1. Remedial action schedule.

Activity	Start Date	Completion Date	Enforceable Date
Draft RD/RA Scope of Work sent to Agencies for review	10/1/02	11/19/02	—
RD/RA Scope of Work finalized	11/10/02	3/4/03	—
Draft Phase I RD/RA Work Plan sent to Agencies for review	2/4/03	9/30/03	9/30/03
Agency review of the Draft Phase I RD/RA Work Plan	10/1/03	11/17/03	—
Agency comments on Draft Phase I RD/RA Work Plan due	—	11/17/03	—
Resolution of Phase I RD/RA Work Plan	11/18/03	12/21/03	—
Draft final Phase I RD/RA Work Plan sent to Agencies	12/23/03	1/21/04	—
Phase I RD/RA Work Plan finalized	1/22/04	2/4/04	—
Phase I remedial action	2/5/04	6/4/04	—
Phase I prefinal inspection	5/21/04	6/14/04	—
Prefinal Inspection Report for Phase I preparation and internal review	6/7/04	6/21/04	—
Prefinal Inspection Report for Phase I submitted to Agencies	—	6/22/04	—
Draft Phase I Remedial Action Report submitted to Agencies	8/30/04	8/30/04	8/31/04

Table 3-1. (continued).

Activity	Start Date	Completion Date	Enforceable Date
Ecological monitoring ^a	10/1/03	9/30/78	—
First five-year review conducted	10/1/08	10/1/08	—
Draft Operations and Maintenance Report submitted	5/31/08	5/31/08	5/31/08

a. During negotiation on scope for Phase I remediation, the Agencies determined the period for ecological monitoring should be 75 years.

RD/RA = remedial design/remedial action

3.5 Project Cost Estimate

The project cost estimate is included in Table 3-2. In estimating the cost for ecological monitoring over 75 years, it was assumed that the same level of sampling would be performed each year even though it is anticipated that the frequency and extent of sampling may be reduced in the future. However, at this time it cannot be predicted when it would be appropriate to reduce sampling, since changes in land uses and long-term management plans for the INEEL could influence the need for and extent of ecological monitoring. The cost estimate may be revised during subsequent submission of this document to reflect the most current estimate, based on comments to the design and other data.

Table 3-2. Phase I project cost estimate.

Description	Cost (Net Present Value)	Totals
Capital Costs		303,000
Remedial Design	276,000	—
Remedial design/remedial action scope of work	11,000	—
Remedial design/remedial action work plan	85,000	—
Hazards and safety analysis documentation	84,000	—
Operations and maintenance plan	85,000	—
Remedial Action	28,000	—
Remedial action implementation	18,000	—
Inspections	10,000	—
Removal Action	10,000	—
Remedial Action Report	10,000	—
Operations Cost		2,074,000
Data collection and management for INEEL-wide 5-year reviews (100 years)	259,000	—
Annual operations and maintenance activities (through 2035)	1,815,000	—
Ecological Monitoring Cost (through 2078)		14,878,000
Site walk-downs	385,000	—
Planning and reporting	3,990,000	—
Sampling and analysis	9,209,000	—
Project management	1,294,000	—
SUBTOTAL COSTS		17,255,000
Plus 30% contingency		5,176,500
TOTAL PROJECT COST IN NET PRESENT VALUE		22,431,500

NOTE: *Net present value is the cumulative worth of all costs, as of the beginning of the first year of activities (i.e., Fiscal Year 2003), accounting for inflation of future costs. Net present values are estimated assuming variable annual inflation factors for the first 10 years, in accordance with U.S. Department of Energy Order 430.1B, "Real Property Asset Management," followed by a constant 5% annual inflation rate. A constant 5% discount rate is assumed.*

4. PLANS

This section describes the plans associated with Phase I remedial action of OU 10-04 sites involving institutional controls and INEEL-wide ecological monitoring.

4.1 Operation and Maintenance Plan

The *Operations and Maintenance Plan for Operable Units 6-05 and 10-04, Phase I* (DOE-ID 2003b) describes the long-term O&M activities that will be conducted as part of institutional control activities for OU 10-04 sites to ensure adequate protection of human health. The primary requirements for monitoring and enforcing institutional controls are included in the Sitewide Institutional Controls Plan (DOE-ID 2003c) and are referenced accordingly. The additional requirements to remove or isolate ordnance and explosives that pose an unacceptable near-term physical hazard for OU 10-04 sites under the prerediation institutional control period are addressed in the Phase I O&M Plan (DOE-ID 2003b).

4.2 Health and Safety Plan

A specific health and safety plan is not required for implementing institutional controls at OU 10-04 sites since the identified institutional controls are administrative (see Table 2-1), and it can be demonstrated that there will not be any worker exposure during tasks to be conducted.

For OU 10-04 activities involving ordnance and explosives, the *Health and Safety Plan for the Removal and Detonation of Unexploded Ordnance at the INEEL* (INEEL 2002) establishes the procedures and requirements to eliminate or minimize health and safety hazards to personnel.

4.3 Spill Prevention/Response Program

Any spill of potentially hazardous materials will be remediated in compliance with the requirements of Plan (PLN) –114, “INEEL Emergency Plan/RCRA Contingency Plan.” All materials will be handled in accordance with the specifications contained in applicable material-safety data sheets.

4.4 Field Sampling Plan

A specific field sampling plan is not required for Phase I remediation of OU 10-04 to implement institutional controls at OU 10-04 sites, because the identified institutional controls are administrative and do not include environmental monitoring.

Field sampling will be conducted as part of the long-term ecological monitoring to be conducted under OU 10-04 Phase I remediation. The field sampling plan for the ecological monitoring is included in the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory* (INEEL 2004).

Although the O&M Plan associated with this RD/RA Work Plan addresses UXO and TNT/RDX to a limited extent, no specific field sampling will be conducted under Phase I to survey areas to detect UXO and TNT/RDX fragments that pose an unacceptable near-term physical hazard. Rather, it will be during routine operations at the INEEL (e.g., performing ecological monitoring, drilling new groundwater monitoring wells, and performing a site walk-down after a range fire) that potential UXO and TNT/RDX problems would be identified for evaluation by explosives experts to determine if the hazard is sufficient to warrant immediate removal and disposal or isolation in an exclusion zone.

4.5 Waste Management Plan

Waste will not be generated from implementation of institutional controls at OU 10-04 sites, because only administrative controls are required (see Table 2-1). Management of waste generated because of long-term ecological monitoring is addressed in the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory* (INEEL 2004).

Management of waste generated due to any surface clearance of UXO, and or TNT/RDX fragments that pose an unacceptable near-term physical hazard, is addressed in the *Operations and Maintenance Plan for Operable Units 6-05 and 10-04, Phase I* (DOE-ID 2003b).

5. REMEDIAL ACTION REPORT

The remedial action report will be prepared following implementation of institutional controls for OU 10-04 sites and will be submitted to the Agencies as a primary document. If necessary, the O&M Plan will also be updated. Details of the remedial action report will include:

- Identification of work performed
- Documentation of actions undertaken to implement the required institutional controls and associated monitoring of these controls
- Description of the ecological monitoring program
- Summary of any detection, assessment, and disposition of ordnance
- Explanation of any modifications to the work plans
- Problems encountered during remedial actions and resolutions to these problems
- Any open or unresolved issues from prefinal inspection reports that were identified and described
- Certification attesting that the remedy is operational and functional
- Costs for implementing the OU 10-04 institutional control remedial action and long-term ecological monitoring
- Results of the final inspection.

5.1 Prefinal Inspection Report

Documentation of the prefinal inspection will be provided in a prefinal inspection report, which will include the following elements:

- The names, titles, and organizational affiliations of all inspection participants
- Inspection checklist identifying specific project components to be inspected
- Discussion of inspection findings
- Corrective actions to address deficiencies
- Date of the final inspection.

The prefinal inspection report will be issued to the EPA and IDEQ as a secondary document. The report will indicate how objectives of the OU 10-04 ROD (DOE-ID 2002a) for institutional control are being met. The submittal schedule for the prefinal inspection report is shown in Table 3-1.

5.2 Final Inspection

A final inspection may not be necessary if the Agencies agree that there are no significant findings during the prefinal inspection. Final inspections, as conducted by the Agencies' project managers or their designees, will confirm the resolution of all outstanding items identified in the prefinal inspection and will verify the OU 10-04 remedial action for institutional control has been completed in accordance with the requirements of the OU 10-04 ROD (DOE-ID 2002a). Final inspections will be documented in the final remedial action report.

6. FIVE-YEAR REVIEW

In accordance with the “National Oil and Hazardous Substances Pollution Contingency Plan” (40 CFR 300) for sites where contamination is left in place above risk-based levels for unrestricted use, a review of the selected remedy will be conducted every 5 years until the Agencies determine further review is unnecessary. During the 5-year review, the remedy will be evaluated to determine if it remains protective of human health and the environment. The review also includes an evaluation of new data that could change the monitoring or controls in place for the sites. All sites requiring institutional controls will be assessed annually and reviewed on a 5-year basis from the time the remedial action for institutional controls is initiated until it is determined during a 5-year review that the controls are no longer needed.

7. REFERENCES

- 40 CFR 300, 2003, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register, November 17, 2003.
- 42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*, December 11, 1980.
- DOE O 231.1A, 2003, "Environment, Safety, and Health Reporting," U.S. Department of Energy, August 2003.
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- DOE-ID, 2002b, *Proposed Plan for Operable Unit 10-04, Waste Area Groups 6 and 10*, Document ID:10956, U.S. Department of Energy, Idaho Field Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Environmental Quality, January 2002.
- DOE-ID, 2002c, *INEEL Long-Term Stewardship Strategic Plan*, DOE/ID-11008, Revision 0, U.S. Department of Energy Idaho Operations Office, September 2002.
- DOE-ID, 2003a, *Operable Units 6-05 and 10-04, Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites, Remedial Design/Remedial Action Scope of Work*, DOE/ID-11035, Revision 0, U.S. Department of Energy Idaho Operations Office, February 2003.
- DOE-ID, 2003b, *Operations and Maintenance Plan for Operable Units 6-05 and 10-04, Phase I*, DOE/ID-11102, Revision 0 (or most current revision), U.S. Department of Energy Idaho Operations Office, December 2003.
- DOE-ID, 2003c, *Idaho National Engineering and Environmental Laboratory Sitewide Institutional Controls Plan for CERCLA Response Actions*, DOE/ID-11042, Revision 0 (or most current revision), U.S. Department of Energy Idaho Operations Office, December 2003.
- EPA, 1999, Memorandum, "Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities," U.S. Environmental Protection Agency, Region 10, Office of Environmental Cleanup, May 3, 1999.
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